US009636705B2

(12) **United States Patent**
Böhm et al.

(10) **Patent No.: US 9,636,705 B2**
(45) **Date of Patent: May 2, 2017**

(54) **MICROWAVE CURING OF MULTI-LAYER COATINGS**

(71) Applicant: **TATA STEEL UK LIMITED**, London (GB)

(72) Inventors: **Sivasambu Böhm**, Rotherham (GB); **Henagama Liyanage Mallika Böhm**, Rotherham (GB); **Sreedhara Sarma**, Rotherham (GB)

(73) Assignee: **TATA STEEL UK LIMITED**, London (GB)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 3 days.

(21) Appl. No.: **14/413,654**

(22) PCT Filed: **Jul. 3, 2013**

(86) PCT No.: **PCT/EP2013/001952**
§ 371 (c)(1),
(2) Date: **Jan. 8, 2015**

(87) PCT Pub. No.: **WO2014/008993**
PCT Pub. Date: **Jan. 16, 2014**

(65) **Prior Publication Data**

US 2015/0140723 A1 May 21, 2015

(30) **Foreign Application Priority Data**

Jul. 12, 2012 (EP) 12005154

(51) **Int. Cl.**
H01L 21/00 (2006.01)
B05D 3/06 (2006.01)
(Continued)

(52) **U.S. Cl.**
CPC ***B05D 3/068*** (2013.01); ***B05D 3/029*** (2013.01); ***B05D 7/14*** (2013.01); ***H01L 31/18*** (2013.01);
(Continued)

(58) **Field of Classification Search**
CPC H01L 31/18; B05D 3/068
(Continued)

(56) **References Cited**

U.S. PATENT DOCUMENTS

6,242,041 B1 6/2001 Katoot et al.
6,312,548 B1 * 11/2001 Fathi B29C 65/1425 156/275.1
(Continued)

FOREIGN PATENT DOCUMENTS

WO 9924174 A1 5/1999
WO WO 0128771 A1 * 4/2001 ..... B01J 19/126
WO 2008055926 A1 5/2008

OTHER PUBLICATIONS

International Search Report dated Aug. 22, 2013 from International Application PCT/EP2013/001952 to Tata Steel UK Limited filed Jul. 3, 2013.

Primary Examiner — Igwe U Anya
(74) *Attorney, Agent, or Firm* — Vorys, Sater, Seymour and Pease LLP

(57) **ABSTRACT**

A method for providing a coated strip, which includes the steps of providing a metal or metal alloy strip, applying one or more coating layers on the metal or metal alloy strip and irradiating one or more of the applied coating layers with electromagnetic radiation, wherein one or more of the applied coating layers includes dielectric particles capable of absorbing microwave radiation and wherein microwave radiation is used to selectively heat one or more of the coating layers containing the dielectric particles to dry and/or cure and/or sinter the coating layer.

18 Claims, 3 Drawing Sheets